Can small actions lead to great changes? Learning from some recent experiences

Abstract

For “big questions”, it is often said that “big answers” are needed. However, there are some reasons to believe that small actions can improve the quality of life of millions of people. Small-scale strategies can be especially designed to reach the poorest of the poor –who are usually excluded from the benefits of broader policies – and with the help of developed techniques (as RCTs) their impact can be directly measured.

Although some well-intentioned policies can be frustrated by the bad quality of institutions, the “good news” is that this does not act as a necessary condition to the success of carefully designed and implemented small scale policies. In all the dimensions covered here (health, water access, electricity, education and microfinance) there are remarkable experiences that lead to the answer for the question in the title: “Yes”.

CHAPTER

Electricity

Author

Koen Ruesen

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Electricity

Energy is crucial to human well-being and it generates economic development. While in most western countries electricity is seen as a common good, in many other countries people have barely access to a sustainable power source for electricity. According to the International Energy Agency an estimated 1.3 billion people in the world are without access to electricity. Furthermore, over 2.7 billion people are without clean cooking facilities. The majority of these people, 95% of them, live in sub-Saharan Africa or developing Asia and 84% live in rural areas, far away from National Grids (IEA, 2011).

If current policies do not change, the International Energy Agency predicts there will still be 1.2 billion people who have no access to electricity by the year 2030. The number of people without electricity located in Sub-Saharan Africa is even predicted to rise under current policies (IEA, 2008).

As described above, the role of electricity is crucial for development. Access to energy reduces hunger and improves access to fresh drinking water through the ability of preserving food and pumping clean water via a pumping system.

Importance of Electricity

Electricity should not only be a means of power delivery but also should lead to sustainable development and stimulate the growth of local markets. As electricity is more than only a way of power delivery, the technological solution which energy provides to a community should permit the development of 'productive uses' of electricity (ARE, 2011).

'Productive use' can be defined as the use of energy/electricity for generating value or income (ARE, 2011). While productive use of electricity is commonly linked to generating activities such as power for agricultural, industrial and commercial uses, it gives a community much more. A community which has access to electricity will generate a surplus within the domestic economy. The access to electricity will save people money otherwise spent on other expensive means of lighting (e.g. candles, kerosene, batteries) and it will provide an opportunity to create value (making products).

Electricity plays an important role in the enhancement of education activities (e.g. studying at night) and it improves health services (see section 2 Health and section 4 Education). Next to that, electricity can establish communication technologies, which could also play an important role in the economic development of a rural area.

Generating Electricity in rural areas

As described above, 84% of people without access to electricity live in rural areas. To come up with a solution to the lack of electricity in developing nations, the electrification of these rural areas is a key. While simply extending the national electricity grid is usually not possible due to the fact that these rural areas are so remote and the initial cost of investment would be too high, other ways of generating energy, like Electric Home Systems or Mini-grids, are probably more feasible.

Electricity Home Systems

Electricity Home Systems (EHS) are designed to power individual households or small buildings (e.g. schools, community centres) and provide an easily accessible and rather inexpensive solution. There are a number of systems which can be identified as EHS; Stand-alone PV systems, Small wind home systems and small hydro-power systems.

Stand-alone PV-systems

One such system which can be qualified as an EHS is a stand-alone off-grid PV system. These PV-systems, that cover the electricity needs of single households, public or commercial buildings, offer a user-friendly and cost-effective solution to the electrification of rural areas. These systems can replace the basic products, which people use for lighting, as well as run additional applications which are usually driven by dry-cell batteries or diesel generators. While people benefit economically and socially from these systems, it also reduces the risk of health and environmental issues due to the reduction of toxic gasses from traditional sources of energy.

One such PV-system, called the Pico PV system, is one of the smallest systems on the market today. The Pico PV system has a power output of 1 to 10W and can be used for lighting and mobile phone charging. While Pico PV systems usually cost around €50 to €150, smaller systems and solar lamps start from €7, well within the payment capacity of most people living in rural areas (ARE, 2011).

The results of PV-systems, like the Pico PV system, can be seen in rural Mozambique, where most households lack the basic electrical service. Here, kerosene is the most common use of lighting, which often result in sever health problems for local residents. A German off-grid solar power installation company installed Pico PV systems rural villages, which showed significant improvement in living. The systems gave local people bright and clean electric lighting, which can be used for evening activities such as school studies. It also improved the living environment through the reduction of kerosene use. As local people had to be learned how to operate and install the PV-systems, jobs were created, including additional working places for the local community (ARE, 2011 (3)).

In a case study done in South Africa, a utility model was considered for supplying Solar Home Systems (SHS) to rural areas. The utility service would be a fee-for-service model including the maintenance of the off-grid solar systems by the utility company. As it was clear from the beginning of the study, the poor rural households for whom the solar home systems were intended would not be able to pay the initial capital cost, the South African government gave a subsidy of R3500 (€350) for each installed solar system. The households had to pay R110 (€11) as an installation fee and a monthly R58 (€6) service fee. Although the SHS technology was easy to use and owners were happy having electricity for lighting and other appliances, they still had to use other energy sources, like fuel-wood, kerosene or gas to meet their cooking needs. Next to that, the poorest of the poor could afford neither the initial installation fee nor the monthly service fee. An additional monthly subsidy of R40/month (€4) for users mad the solar home system more affordable to more poor rural households (Prasad, 2007).

Small wind home systems

Next to small PV installations, small wind home systems are also a viable option for generating energy in rural areas. Small Wind Turbines are usually turbines with a diameter of less than 7 meters and a generating capacity between 1kW and 10kW. For household size installations, wind turbines with a diameter of 2 meters and an energy output of 1kW are used. These wind energy systems require modest wind speeds (5 m/sec) to generate a decent amount of energy (ARE, 2011).

Small wind turbines (SMTs) are in a higher price category than PV systems. Therefore most of these SMTs are partly financed by an external organization as the initial investment is high. However, projects like the one in Madagascar, where small wind systems were installed, show that electricity prices can drop significantly compared to power from diesel generators (ARE, 2011 (3)).

In another case where small wind home systems lead to significant improvement of living conditions and thus reduced poverty was in Naqu, in the Tibet region, China. With an annual wind speed of 5.1 m/s the region is excellent for renewable energy sources. By providing a 15 kW wind system and a 5kW solar system living conditions of households improved. The electricity generated with this duo-system enabled about 80 people to get lighting, telecommunications and entertainment services (ARE, 2011 (3)).

Small Hydro-power systems

Small Hydro-power (SHP) has many benefits over other technologies used for the electrification of rural areas. As it is a clean way of producing power, it has a positive effect on health and the environment. Furthermore, SHP is highly efficient (up to 90%) and relatively cheap to operate and maintain. SHP systems can vary from 0.2kW to 800kW, essentially giving it the possibility to generate electricity for one household or a whole community. One downside however, is that the system needs a flowing stream of water to be able to generate electricity.

Small Hydro-power has one of the highest lifespan of all small scale energy systems, namely up to 100 years. Therefore it has an attractive pay-back ratio, for both developed as developing nations. Compared to PV systems or small wind power, SHP requires substantial investments although operating costs are very low (Macquarie, 2009).

Mini-grids

Mini-grids, like EHS, can provide electricity generation at the local level. While a mini-grid works community-wide, compared to the EHS which is mainly per household, it can provide a stable power supply to local businesses, public buildings and households using village-wide distribution networks. These systems are often powered by fossil fuel (e.g. diesel), but can also make use of local renewable energy sources (ARE).

What to use for a mini-grid depends on the availability of local resources, which could be wind, solar or hydro power. The components selected for a (hybrid) mini-grid will influence the life of the system and how affordable the system will be for the users. The most affordable, in initial investment that is, mini-grid system would be a 100% diesel powered generators. However, this short term investment decision has dramatic influence on the system's lifetime and will not be the best decision for the long run due to higher generation costs (ARE, 2011 (2)).

A hybrid mini-grid system (e.g. diesel & wind) would have a higher initial investment, while the lifetime costs of the system would be lower. Next to that, rural areas would be more autonomous as less fuel has to be imported into the region.

Electricity can boost business

Access to a reliable source of energy can significantly boost business in poor rural areas. In a survey done in Zimbabwe, entrepreneurs faced the most problems with financing (30%), followed by electricity problems (23%). After introducing electricity, 40% of the local people started an enterprise. The new enterprises mainly existed of Grinding Mills, Butcheries, Bottle Stores and more Retailing stores. Furthermore, a service sector emerged, as barber shops, restaurants and night clubs were established (Mapako and Prasad).

As described above, besides the practical domestic use of electricity, people in rural areas can use electricity to run small businesses. A local entrepreneur, who operates a maize-grinding mill in Nyimba, Zambia, can work into the night as he has installed a solar energy system. Now he is able to meet all his customers' orders. Nyimba Energy Service Company (NESCO), funded by the Swedish International Development Agency, provided the entrepreneur with the solar panels. For a cost of around €25, and a monthly rental fee, people in rural Zambia can purchase a solar energy system (Africa Renewal, 2006).

Conclusion

While infrastructural investments in remote areas can be different for every area, reliable and clean energy do have a significant impact on poverty in these rural areas. While hybrid mini-grid systems or hydro-power systems would be the most efficient way of delivering electricity to rural areas, it is not always the best option for the people living in these poor areas. Initial high investments for an electricity infrastructure can be too expensive for the local people, or the lack of accessibility to the area can also interrupt the import of diesel from populated regions. Therefore systems as small wind turbines or PV-systems can be more effective.

Whether the use of PV-systems or mini-grids, electrification gives people in rural areas the opportunity to develop and grow their income. Through the use of lighting poor people are able to perform more activities, such as studying at night, and start enterprises. As enterprises usually mean economic growth, electrification of poor rural areas can be the key to reduce poverty.

However, whether major poverty reduction can be solely achieved by electrification is yet to be seen. What can be concluded is that electricity plays an important role in reducing poverty, mainly as an assistant for other dimensions, such as education, health and business.

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